

Recycling automotive plastics is profitable and good for the environment

ARGONNE, Ill. (Nov. 11, 2005) — Recycling is not just good for the environment, it is good for business. Argonne researchers have developed a technology to successfully recover plastic from obsolete automobiles that may add plastic to the list of valuable materials recycled from old cars and trucks.

"About 75 percent of the weight of an obsolete car is already profitably recycled," explained [Energy Systems Division](#) Director Ed Daniels, "so we are working on the balance of that material." Developing and evaluating new process technology for industry is one of Energy Systems Division's main thrusts.

Old cars and trucks end their days at dismantling facilities where usable parts are recovered. The metal is recycled next, leaving shredder residue — polyurethane foam, polymers, and some metal oxides, glass and dirt. Between 3 and 4.5 million tons of shredder residue a year ends up in landfills.

Argonne is working with the [American Plastics Council](#) and the [Vehicle Recycling Partnership of USCAR](#) to develop and advance sustainable technologies for automotive materials recycling.

Current research at Argonne is focused on "mechanical recycling" — recovery of materials such as plastics from shredder residue for re-use in automotive and other applications. The technology being developed at Argonne consists of two major processes. The first is a bulk separation process to separate shredder residue into constituent fractions, followed by the second process, which recovers specific plastics from a polymer concentrate.

Researchers designed and installed a large-scale shredder-residue separation pilot plant at Argonne. The mechanical separation facility can process about 1 ton of shredder residue per hour. About one-third of the shredder residue — the plastic-intensive portion — is recovered as a polymer concentrate.

"Our first year of the project we focused on the bulk separation process to ensure that we were getting most of the plastics into the polymer concentrate,"



RECYCLED AUTO PLASTICS — Project Manager Sam Jody holds a knee bolster for a car processed from recovered polyolefin. Automotive plastic recycling begins with auto shredder residue (left), is separated into specific plastics (right) — in this case polyolefins — and made into plastic parts for new cars.



RAINING PLASTIC — Chemist Joe Pomykala checks the flow of polyolefin coming from a tank that separates the recycled auto plastic concentrate into its constituent parts.



Daniels said. At 95 percent, they have recovered more of the plastics in the concentrate than anyone else has done, according to published reports.

Now work turns to the second part of the technology – recovering high-quality plastics from the concentrate. Using a technique Argonne developed earlier – the wet density/froth flotation process – researchers set up a mixed plastics separation facility.

"We take the polymer concentrate from the first part of the process and run it through a series of stages," Daniels explained. "At each stage we recover a specific automotive plastic.

"We have recovered the polyolefins from the concentrate in the first stage at a sufficient quality to produce car parts," Daniels said. A battery tray and steering-column components were made in mold trials from the recovered materials.

"The economics are promising, but we really want to recover some of the other plastics from the polymer concentrate," Daniels said. "We are working to determine how much material is actually recoverable and the quality at which we can recover each of the different polymers from the concentrate."

The separation facility has a series of six separation tanks. The chemistry of the solutions in each tank controls the separation effectiveness of the overall process. Researchers are now working to recover acrylonitrile-butadiene-styrene and a number of other specific polymers.

This research is being conducted under a cooperative research and development agreement (CRADA) between Argonne, the American Plastics Council (APC), and USCAR's Vehicle Recycling Partnership (VRP) whose members are [DaimlerChrysler Corp.](#), [Ford Motor Corp.](#), and [General Motors Corp.](#) Funding is provided by the VRP, APC and the U.S. DOE Office of [FreedomCAR and Vehicle Technologies](#).

While Argonne's focus under the CRADA has been on demonstrating mechanical recycling technology; this is just one technical approach the CRADA team is evaluating. Other technologies under study include energy recovery and the conversion of shredder

SORTED PLASTICS – Researchers built a series of tanks to separate recycled plastics by type using Argonne's froth flotation process. The polyolefin flows down by chemist Joe Pomykala while chemical engineer Jeff Spangenberg works at the next separation station.

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residue materials to chemicals and fuels. — *Evelyn
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